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THE WATERFOWL SITUATION: 1938-39

Prepared in the Section of Distribution and Migration of Birds
Division of Wildlife Research

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INTRODUCTION

That an adequate continental supply of migratory waterfowl can be maintained has been abundantly demonstrated by the results of efforts to this end made during the past few years. The only requisite is sound management. This involves restoration and conservation of waterfowl habitat in breeding, migration, and winter ranges, coupled with enforced regulations on hunting. Losses from disease are serious, and while definite progress has been made in determining the causes, their correction is a problem of much greater magnitude. Predation, so far as adult birds is concerned, is negligible.

Although vast sections of the original breeding grounds are now permanently lost, such as remain or may be restored in the Great Plains region of the United States and Canada, together with the vast areas of good habitat north of the agricultural belt in Canada and in Alaska, will continue to furnish enough birds for reasonable sport if the breeding stock is preserved

to populate them. Alaska alone probably furnishes a much larger percentage of the continental supply of waterfowl than that Territory has been credited with. Restoration of all possible habitat in the settled regions, however, is essential, for every potential breeding ground is of importance in direct ratio to its size and the excellence of its environmental conditions. Furthermore, the refuges on breeding grounds become sanctuary areas for migrants from farther north.

The preservation of vast areas for winter quarters in the South is of even greater importance. This applies particularly to the Southeastern States, where the great majority of the ducks and geese of the Atlantic and Mississippi Flyways spend the winter. Fortunately for the Central and Pacific Flyways, their birds are comparatively unmolested on adequate wintering grounds in Mexico. In the following pages are outlined the results of waterfowl investigations made by the Biological Survey from the spring migration of 1938 through the winter of 1938-39.

SPRING MIGRATION

The northward movement of the ducks and geese during the spring of 1938 was again observed by the Bureau's corps of carefully selected volunteer cooperators. Elimination of some of last year's observers resulted in a somewhat reduced volume of data, but the distribution of observers throughout the country remains satisfactory. Furthermore, recommendations by regional directors, flyway biologists, game management agents, and others, resulted in the enlistment of sufficient new observers to assure an even better coverage for the fall migration.

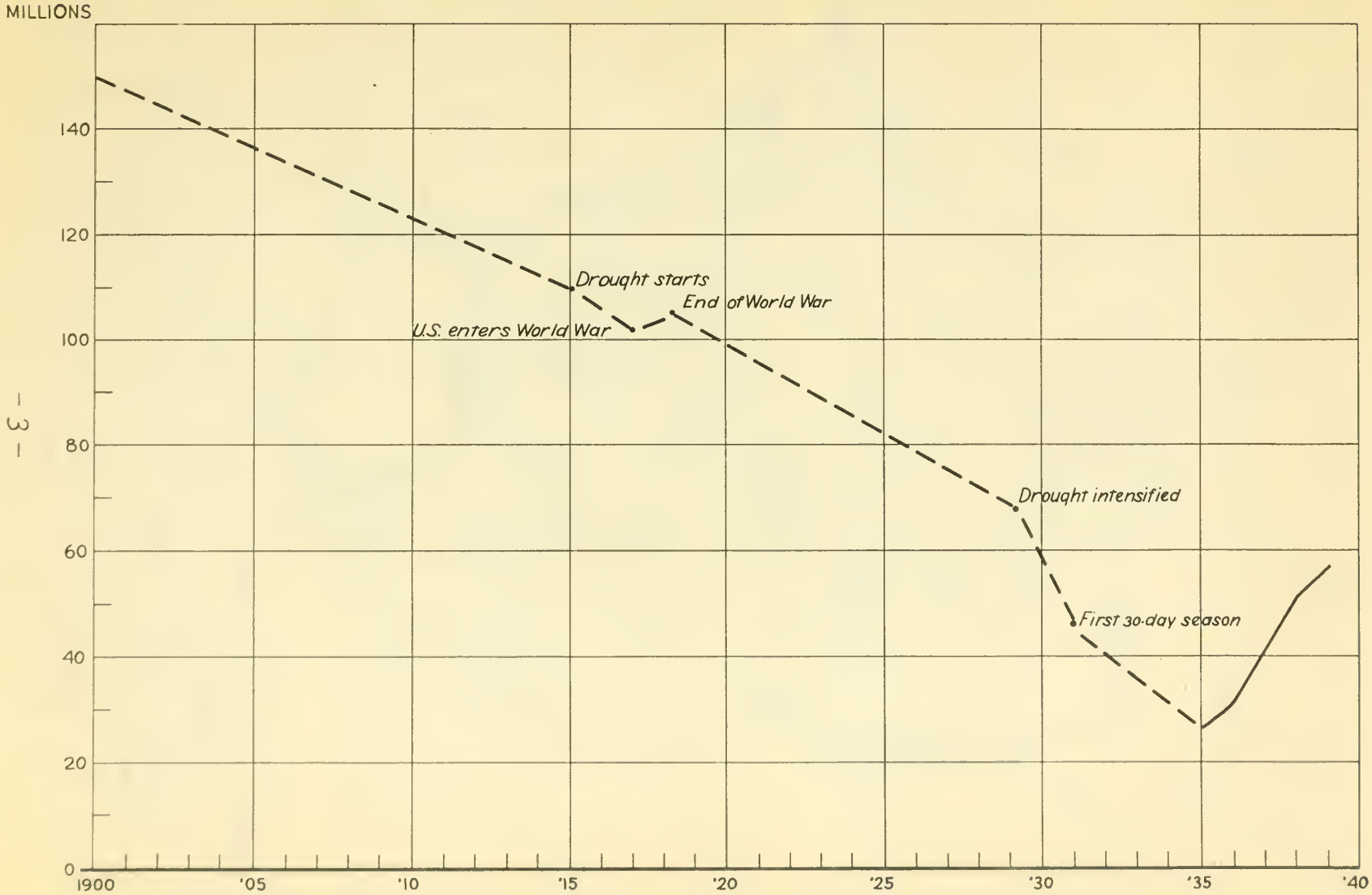
Analyses of reports received show some leveling off of the curve that, after the low point of 1934-35, had had a continuous upward trend (see chart, p. 3).

TABLE 1.--Comparison of reports on the waterfowl situation for the spring migrations of 1937 and 1938

Year	No change	Increase	Decrease	Total
	Number	Number	Number	Number
1937 - - -	81	235	63	379
1938 - - -	81	213	42	336

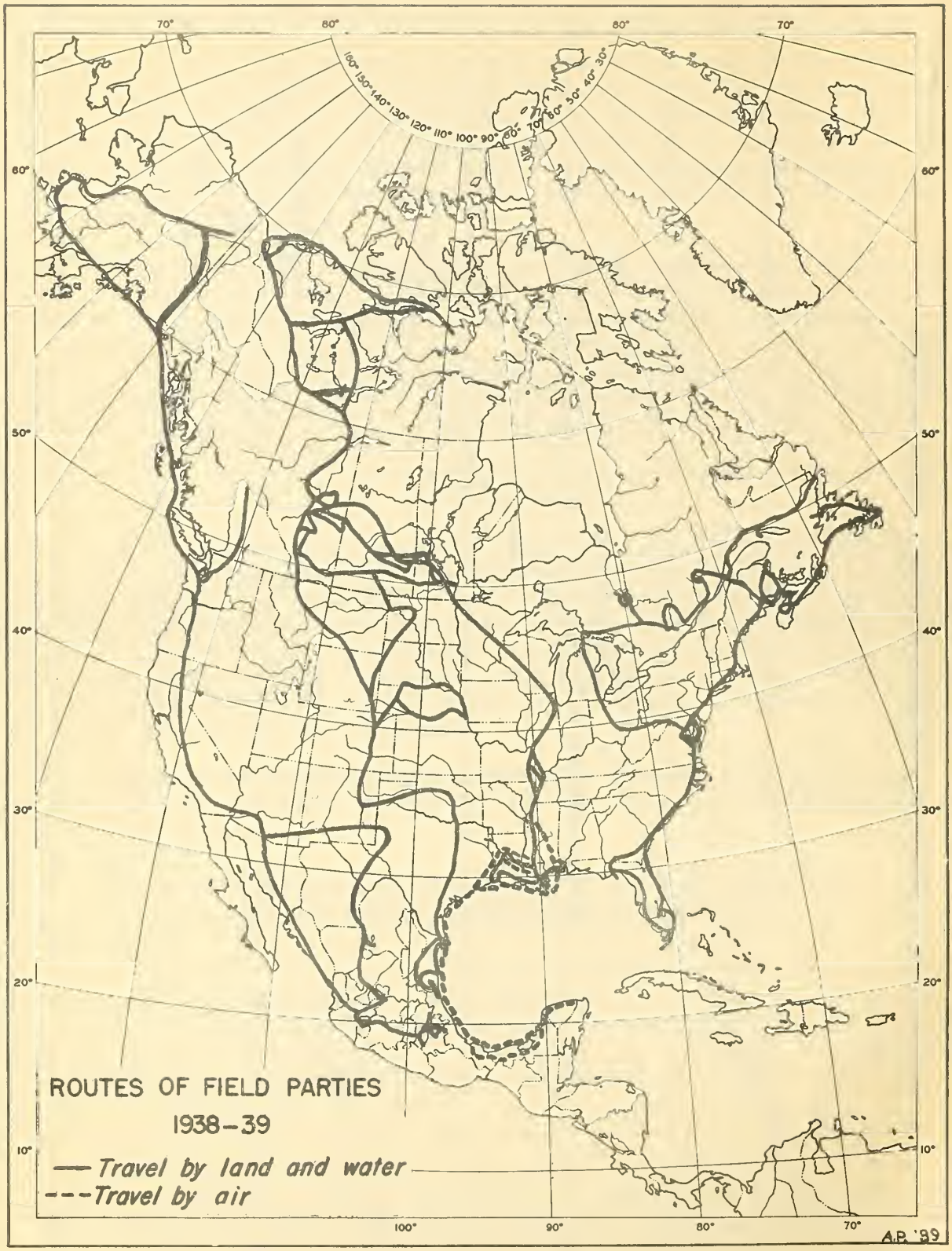
It will be noted from table 1 that the reduction in the number of "decreases" reported is practically offset by the reduction in the number of reports of "increases." A percentage analysis, however, indicates a small gain in the abundance of the birds. Considered by flyways, the result indicated important increases in the Mississippi and Atlantic Flyways, and these were further demonstrated by a study of the reported status of individual species. The reports from the Atlantic Flyway reflected a favorable

WATERFOWL POPULATION, 1900-1939



- - - - 1900-1934 represents consensus of best observers; accurate data do not exist.

——— 1935-1939 based on January Inventory.


ROUTES OF FIELD PARTIES
1938-39
— Travel by land and water
--- Travel by air
A.P. '39

situation, unquestionably because of a welcome increase in the numbers of the black duck, canvasback, scaups, and the Canada goose, while those from the Mississippi Flyway showed material gains for the mallard, ringneck, and blue and Canada geese. In the Central and Pacific Flyways, on the other hand, the status of the pintail, gadwall, and baldpate showed little if any improvement.

BREEDING-GROUND SURVEYS

Pacific Flyway

Leaving headquarters early in May, the Survey biologist for the Pacific Flyway proceeded northward into British Columbia, inspecting en route important waterfowl nesting grounds in northern California, Oregon, and Washington (see map, p. 4). An exceptionally heavy precipitation during the preceding winter produced a most satisfactory water situation in southern Oregon and northern California. Along the boundary of these two States were found a considerable number of ducks and Canada geese, with some sandhill cranes, but it was "very evident that the nesting grounds are greatly understocked with breeding birds."

Reaching Canada, the investigator resumed his studies in the Okanagan, Fraser, and Thompson River Valleys, traveling northward to Williams Lake in the Cariboo country. The drainage basins of these rivers furnish many important waterfowl breeding, feeding, and resting areas, chiefly in the sloughs and pot holes of the valley floors and contiguous hilly benchlands. Despite a rather dry spring, water conditions were good, and in general the waterfowl habitat was normal. Nevertheless, in part of this Province a smaller number of ducks was recorded than last year, but this may be explained by the fact that an earlier season resulted in incubation being in progress. Residents were agreed that the spring migration showed an improvement over previous years, but the flyway biologist summarized his report by stating that he could detect no important change in comparison with preceding seasons. This may be taken to indicate a satisfactory condition in this Province, where there has been minimum despoliation of the habitat. It is to be remembered that there are no large marshes in British Columbia where ducks and geese might breed in concentrations. Instead, scattered pairs nest over a vast expanse of country, and in the aggregate, the production is fairly large.

Returning to Seattle, Wash., early in June, the Pacific Flyway biologist proceeded by steamer to Juneau, Alaska, arriving on June 14, and devoted the rest of the season to a reconnaissance of the important waterfowl areas in that Territory, in cooperation with the Alaska Game Commission. Traveling by air to Fairbanks, he had opportunity for a cursory examination of Lakes Labarge, Aishihik, and Wellesley, in Yukon Territory, as well as of numerous small lakes, sloughs, pot holes, and muskegs in the valleys of the Nesling, White, and Tanana Rivers. As the plane approached Fairbanks some of the best waterfowl habitat was seen at the confluence of the Tanana and Yukon. The first field headquarters north of Fairbanks was established

at Fort Yukon, north of the Arctic Circle, from which point investigations were made by boat up the Porcupine and Black Rivers toward the Canadian border.

After these preliminary observations the biologist began the long trip down the Yukon, reaching the upper edge of the delta country on July 22. Here he explored many of the channels of the river out to Hooper Bay on the coast of the Bering Sea. An hour's flight took him across the intricate maze of channels and muskegs to the delta of the Kuskokwim River, where he made similar studies, and he finally reached Dillingham, on Bristol Bay near the foot of the Alaska Peninsula, on September 4. From this point and with the many vicissitudes incident to travel in the North, his return to Juneau was made by way of Iliamna Lake, Cook Inlet, Anchorage, Valdez, and Cordova.

In summing up his voluminous report, the biologist of the Pacific Flyway wrote that "it is beyond the scope of imagination for the average resident of the South to visualize even remotely the extent of the northern nesting grounds." He stated that natural food plants were plentiful in every important area, sago pondweed, the well-known favority food of many species of ducks, being abundant in a large percentage of the sloughs and rivers, while a broad-leaved species also was common.

Alaskans generally reported an improvement in the supply of ducks, but they also commented upon a reduced number of geese. Native and white residents of many years' experience all admitted the improvement of the last few years, but also referred continually to the hosts of birds formerly seen even as late as 15 to 20 years ago. The Alaskan studies showed clearly that the available habitat in this great breeding ground is woefully underpopulated, although a marked improvement is noted over conditions of a few years ago.

Central and Mississippi Flyways

Since the northern parts of the Central and Mississippi Flyways coalesce, it was possible for the biologists assigned to them to divide their efforts to mutual advantage (see map, p. 4). Accordingly, the Central Flyway biologist spent the season in Alberta and Saskatchewan, while the Mississippi Flyway biologist, after brief investigations in southern Manitoba, resumed his investigations in the Northwest Territories.

Although the average precipitation in Alberta and Saskatchewan was still far below normal, somewhat more favorable nesting conditions made it advisable to undertake more detailed studies in the southern districts than were warranted in 1937. Efforts were therefore concentrated largely in areas south of the latitude of Edmonton, although observations were made as far north as Lac la Biche and Prince Albert.

The shortage of water was still extremely serious, and thousands of sloughs were dry in the extreme southern part of Alberta east of Calgary

and MacLeod. In fact, the sloughs with water were few, as compared with those that were dry. Some, however, were sufficiently filled by the run-off of irrigation water to be satisfactory for nesting waterfowl. Some of the water areas had a fair duck population, but the average was low, especially in terms of birds actually raised. North of Calgary to latitude 52° most of the prairie lakes and sloughs remained dry or were so lacking in cover as not to be attractive to many ducks. A few better nesting habitats were located, but even on these the duck population averaged no more than fair. Immediately to the north of this zone, the investigator found conditions somewhat better and estimated an increase of approximately 15 percent in nesting gadwalls and possibly as much as 20 percent in the total duck population.

Drought conditions in many localities of Saskatchewan have been continuous for so many years that relatively little general improvement was to be expected. The pot hole sectors in the southern part of the Province remained dry or otherwise unattractive to ducks. Of the 15 bird sanctuaries in this Province that were dry in 1937, 6 remained so in 1938, as did also 9 of the 13 public shooting grounds. Nevertheless, field studies indicated a slight improvement, though this may have been offset by mortality among young ducks as a result of early drying of sloughs and ponds. Of the lakes that 10 or more years ago provided excellent waterfowl nesting conditions, scores continued to be dry. Reports from sections about Prince Albert indicated that pot holes were even drier than in 1937 and that fewer ducks nested there.

Fires in certain large marshes, particularly in Manitoba, continued to be serious problems, as they destroy not only valuable food and cover but also nests and the birds themselves. On one section of 10,400 acres south of the town of Delta, a Biological Survey observer and a Canadian cooperator counted 1,300 duck nests, averaging 8 eggs each, that had been destroyed by a fire that had swept an area estimated to be fully ten times as large as that studied.

In the southern part of this Province, however, particularly in the marshes at the south end of Lake Manitoba, a marked improvement was noted and a decided increase in the number of redheads and canvasbacks, and some increase also of shovelers.

Duck sickness, probably botulism, was reported from several localities in Alberta and Saskatchewan, but none of the outbreaks appeared to be responsible for a heavy mortality, probably because of the small numbers of birds present. At Buffalo Lake, Saskatchewan, however, there continued to be evidence of a serious infestation of leeches, which attack ducks and probably cause suffocation by filling the respiratory passages. It is not yet positively known whether healthy birds are attacked by the leeches, although in some responsible quarters in Canada it is believed that they are.

There was, however, in general, cause for optimism regarding the duck situation in the Prairie Provinces, for while water conditions showed little if any improvement, it was estimated that the general population of nesting ducks showed a 10-percent increase over that of 1937 and that the broods averaged slightly larger. Nevertheless, it appears certain that these southern areas must continue incapable of supporting more than a very small percentage of their former duck population. This is particularly serious in relation to the redhead, canvasback, gadwall, ruddy, lesser scaup, and blue-winged teal.

The 2,500 square miles of duck-nesting habitat in the great marshes of the Athabaska Delta showed an increased supply of birds (see map, p.4). The biologist of the Mississippi Flyway, who made his fourth consecutive annual trip to this area, reported that while water levels were low, the waterfowl were "considerably more abundant than last year or any year since 1935." Outstanding was the presence of nesting redheads, a species not previously observed there by this investigator. Canvasbacks also were common and showed a slight gain in numbers, a fact worthy of note when it is considered that only 4 years ago this species was decidedly uncommon there. Black ducks also were noted, further evidence that this species is gradually pushing its range northwestward. The report of the investigator shows that the birds are on the increase on this important nesting ground and that conditions are satisfactory. The Athabaska Delta appears to be a place that is not unduly impaired by the changes of time. As a nesting ground it is not being materially altered by man, and there seems little chance that it will change rapidly. Apparently it will continue to function as a waterfowl haven as long as there are birds to populate it.

Proceeding by plane, the biologist resumed the investigations in another of the important waterfowl areas of the North - the lower Mackenzie Delta. After a study of this region it seemed that ducks were not so numerous as in 1937, but the difference was not great and the conclusion was reached that "the number of birds seemed quite satisfactory." Any possible reduction in the duck supply was compensated for by an excellent increase in the number of swans, geese, and black brants. In 1937 only one pair of snow geese was seen in the Okevik area and only a few black brants and swans, but in 1938 the investigator commented that "it seemed almost unbelievable that such an abundance of wildlife could exist where it was so scarce only a year ago." It will be recalled that in 1937 the spring break-up on the Mackenzie was followed by one of the worst floods in the history of the district.

About the middle of July the biologist flew from Aklavik, in the Mackenzie Delta, to Fort Norman, on Great Bear Lake, thence to Coppermine, on Coronation Gulf, and finally reached the easternmost point of his journey in the Arctic at Cambridge Bay, on the southeast coast of Queen Victoria Island. From this point he attempted to fly to Perry River in the Flagstaff Island group, about which practically no information is available. The flight from Cambridge Bay was made on the night of July 18. Perry River was successfully located, but ice conditions made a landing impossible.

From his aerial survey, however, the observer reported that as a waterfowl habitat the Perry River country had all the appearance of a second Mackenzie Delta. Between it and the Ellice River, a distance of about 70 miles, many streams empty into the Queen Maude Sea and the area is dotted with lakes. Reports indicate that pintails are very abundant in this section, which the investigator believed represented a waterfowl nursery probably second to few in the Arctic. It seems probable that the Survey biologist and his pilot are the first to have seen this country from the air and that, as it is so nearly inaccessible, few white men have ever visited it.

Early in August the biologist obtained passage from Victoria Island on a small schooner, and after being buffeted for 14 tempestuous days he reached the Eskimo village of Tuktoyaktuk. From this point, through the assistance of the Northwest Mounted Police, he returned to Aklavik.

Atlantic Flyway

After making a reconnaissance through the Northeastern States, the biologist for the Atlantic Flyway entered Canada on May 11 and devoted the rest of that month, all of June, and the first half of July to extensive investigations of the waterfowl and other birds in New Brunswick and Nova Scotia, and in Quebec, along the north shore of the Gulf of St. Lawrence (see map, p. 4). In Quebec he was accompanied by Harrison F. Lewis, chief Federal migratory bird officer for Ontario and Quebec, and during 12 of the 22 days spent in New Brunswick, by H. H. Ritchie, chief game warden for that Province.

Conditions in New Brunswick, including water and climate, were excellent and indicated that there would be a good increase of wild fowl during the season. From his own observations and from reports of others, the investigator concluded that in this Province an excellent increase over the 1937 numbers was probable in Canada geese and black ducks, with lesser increases in ringnecks, blue- and green-winged teals, wood ducks, and goldeneyes. Woodcocks were reported to be increasing. All indications pointed to a successful nesting season in 1938 in this Province. Eelgrass was reported to be coming back slowly but noticeably. Further investigation of the status of the ring-necked duck showed the species to be widespread and nesting rather commonly in the Maugerville-Jemseg area and in the St. John and Hampton River Valleys. Another important discovery was that pintails were nesting in the Tantramar marshes--six pairs having been noted and one nest with eggs located. Green-winged teals were found to be nesting in several areas and definitely increasing, being nearly as common as the bluewings.

In Nova Scotia, investigations centered in the vicinity of Wolfville, but every important waterfowl area was examined. All observations indicated a slight increase over 1937 in the number of black ducks. A notable increase in blue-winged teals was recorded in the Cornwallis River Valley, but the investigator found no nests of this species and saw no young birds, even as late as August 15. Reports received suggest that the canvasback may occasionally nest in this section.

The coast of Canadian Labrador, in southern Quebec, was covered for a distance of nearly 600 miles from Bradore Bay west to Mingan. In this section the Canadian Government has several migratory-bird sanctuaries, all of which were visited. Trips northward showed the interior to be overflowing with moisture, being a great sponge of sphagnum moss and reindeer lichen interspersed with clumps of Labrador tea and alder, and with scattered larches and spruces. Swarms of mosquitoes and black flies did their best to make life miserable for the investigators. The country is devoid of human population and is relatively unknown even a mile back from the Gulf of St. Lawrence. The coastal strip is rocky and of little value to waterfowl except eider ducks, but other species were found nesting at the heads of the many inlets and in the lakes and ponds of the interior. On one sanctuary, however, pintails, green-winged teals, and about 1,000 eider ducks were nesting, while black ducks, goldeneyes, and old squaws were found on others.

Anticosti Island also was visited, and it was found that the black duck and the goldeneye were common nesters there and that the pintail and the green-winged teal probably breed in limited numbers.

Later in the season Quebec was again entered by way of St. Simeon, and observations were made north into the interior to Lake St. John, Mont Laurier, and Rouyn. At this period some reconnaissance work also was done in Ontario north as far as Cochrane and west to Sault Ste. Marie.

The Atlantic Flyway biologist spent the period July 19 to August 3 in Newfoundland, most of the south coast of which he was enabled to cover through the courtesy and cooperation of the Department of Natural Resources. This survey established the fact that very few waterfowl nest within about 20 miles of the coast and demonstrated the need for more intensive work to ascertain the status of wild-fowl breeding in the interior. As the region is little known, the use of a small seaplane may be necessary to gain an idea of the numbers of ducks and geese produced there. All the information obtained, however, pointed to a successful season with increased production over that of 1937.

Nesting Conditions in the United States

In the United States, on the refuges at least, the results of the breeding season of 1938 were a great success. Reports of increases were unanimous. Improvement factors consisted not only of increased population resulting from curtailment of the kill in recent years, but also of greater stabilization of water levels, better nesting habitats resulting from planting programs and the restriction or prohibition of grazing, selective control of natural enemies, and of more adequate protection of breeding stock along the migration routes and on the wintering grounds.

On the Bear River Migratory Bird Refuge, in Utah, Canada geese were more abundant during the nesting season than for the past several years. A decided increase in this species was observed also on the Malheur Migratory Bird Refuge, in Oregon, at the Red Rock Lakes Migratory Waterfowl Refuge, in southwestern Montana, and at the Tule Lake Wildlife Refuge, in northern California.

At the Lake Bowdoin Migratory Waterfowl Refuge, in north-central Montana, a comparative study of nine important species indicated increases of 10 to more than 200 percent. A like situation was reported for the Medicine Lake Migratory Waterfowl Refuge, farther east in that State, where compared with 47 nests of the blue-winged teal and 10 of the shoveler in 1937, the numbers for 1938 were 77 and 25 respectively.

In 1937 there were relatively few adult or young ducks on the Des Lacs Migratory Waterfowl Refuge, in North Dakota, the aggregate being only about 2,000, but in 1938 with better water conditions, it was estimated that the number rose to 10,000. The refuge manager reports that while in 1937 only two broods of canvasbacks were found, in 1938 there were at least 100 nesting pairs and by July fully 50 ducklings had been seen. On the Lower Souris Migratory Waterfowl Refuge, in the same State, where a wild-fowl study has been conducted for 2 years on 12,000 of its 58,000 acres, 288 nests of six species were found in 1937, whereas in 1938 the number increased to 336. On this refuge also the average nesting success for 6 important species rose from 62 percent in 1937 to 70 percent in 1938.

Increased use of the Lacreek Migratory Waterfowl Refuge, in South Dakota, is well illustrated by the pintail, for which 48 nests were located by June 15, 1938, contrasted with 34 for the previous season. A survey of the breeding ducks on the Sand Lake Migratory Waterfowl Refuge, in this State, showed an increase from the 1936 figure of 533 pairs to 3,807 in 1938. The manager of the Waubay Migratory Waterfowl Refuge, also in South Dakota, reported a decided increase in breeding redheads, ruddy ducks, lesser scaups, canvasbacks, and blue-winged teals. He estimated 1,000 broods on the refuge during June 1938 and commented that with the exception of the pintail the average was several ducklings more per brood than in 1937.

At the Valentine Migratory Waterfowl Refuge, in Nebraska, the manager reported "tremendous" gains made by shovelers, pintails, and teals. During May 1938 more pintail and shoveler nests were found than for all species combined in 1937. In 1938, green-winged teals and baldpates nested on this refuge for the first time.

A 3 to 1 increase in nesting waterfowl in 1937 over 1936 had been observed at the Mud Lake Migratory Waterfowl Refuge, in Minnesota. A still greater increase was noted in 1938, when it was estimated that 25,000 ducks produced 50,000 young. The number of waterfowl nesting there in 1938 was truly remarkable for any refuge, but particularly for this one, parts of which, as late as 1937, were still smoldering in peat fires.

FALL MIGRATION

Reports received from virtually all the continental breeding grounds, despite the fact that conditions in the southern half of the Canadian Prairie Provinces showed little or no improvement, warranted the prediction that there would be a definite and fairly substantial increase in most species of waterfowl during the fall migration of 1938. The shooting regulations

adopted by the Secretary of Agriculture and approved by the President were therefore somewhat liberalized.

Observers were cautioned to be particularly vigilant to detect changes. Reports to the number of 475 were received, representing all States except Alabama, Georgia, and West Virginia. Analyses of these showed that the observers reporting no change in the 1938 flight rose from 43 percent in 1937 to 45 percent in 1938, whereas, those reporting an increase rose from 39 to 44 percent, and those continuing to note a decrease fell from 18 to 11 percent. This healthy sign indicated success in the Bureau's policy of building up the continental supply of birds slowly, while still permitting such shooting privileges as the supply might justify. Although the situation reported for all four flyways was satisfactory, the greatest improvement was in the ducks and geese of the Pacific Flyway. A reduced percentage of increase was recorded for the birds of the Mississippi Flyway.

Table 2 shows the percentage of observers who reported "increase," "decrease," or "no change" for the important game ducks, the Canada goose, and the Atlantic brant, the figures for 1937 being repeated for the sake of comparison.

TABLE 2.--Percentage of observers reporting on fall migration of 1938 and of 1937

Species	No Change		Increase		Decrease	
	1937	1938	1937	1938	1937	1938
	Percent		Percent		Percent	
Mallard	40	26	57	64	3	10
Black duck	8	35	73	58	19	7
Gadwall	28	50	6	40	66	10
Baldpate	43	40	44	53	13	7
Green-winged teal	59	42	34	46	7	12
Blue-winged teal	46	40	41	50	13	10
Shoveler	60	51	24	36	16	13
Pintail	42	37	49	52	9	11
Redhead	29	44	40	43	31	13
Canvasback	35	47	42	42	23	11
Scaups (both)	49	47	46	38	5	15
Ring-necked duck	46	58	22	28	32	14
Goldeneye	56	58	36	33	8	9
Bufflehead	65	53	16	38	19	9
Ruddy duck	50	61	39	31	11	8
Canada goose	37	36	51	53	12	11
Atlantic Brant	18	48	64	21	18	31
Average	42	45	40	42	18	12

As was suggested in the report for 1937-38 (Leaflet BS-111, p.6), the decrease indicated in the gadwall was more apparent than real, and it is gratifying to note that this is one of the species for which the reports for 1938 indicate a recovery. These reports, however, show a falling off in the numbers of both greater and lesser scaups, which is further

borne out by comments in letters received from many sportsmen familiar with areas where these species are known to concentrate. Similarly, while the Atlantic brant showed a satisfactory increase in 1937, the figures for 1938 indicate a loss. This probably is due partly to the fact that the main concentrations occurred farther north than usual. As a consequence, observers farther south, who ordinarily consider the birds common to plentiful, saw in 1938 a relatively small number. An improved status for the redhead and canvasback is a particularly welcome finding.

WINTERING-GROUND SURVEYS

Studies in Mexico

Continuing his investigations in western Mexico, the biologist of the Pacific Flyway crossed into that country during the latter part of November and remained until the first of March (see map, p. 4). He probably is the first man to take a modern low-swung automobile down the western coast from the international border to Guadalajara, for good roads in that part of Mexico are chiefly nonexistent. His trail led through the northwestern States of Sonora, Sinaloa, and Nayarit; the southern tableland States of Jalisco, Michoacan, Guanajuato, Mexico, Morelos, Tlaxcala, Puebla, and Hidalgo; and the central tableland States of Aguas Calientes, Zacatecas, Durango, and Chihuahua. In the 15 States, 1 Territory, and the Federal District, he traveled a total of 6,579 miles, receiving the fullest cooperation and assistance from all Mexican officials, particularly those of the Department of Forests, Game, and Fish, and from American consular and diplomatic officers.

A full account of this work would fill a book of reasonable proportions, so only the high lights can be included here. Suffice it to say that further confirmatory evidence was obtained of the importance of the Mexican wintering grounds to the waterfowl of the Pacific Flyway. It is not an exaggeration to assert that without them the sport of wildfowling in those parts of the United States that are in this flyway would probably cease, for the reason that the former wintering grounds in California have been so largely destroyed by drainage and other agricultural activities.

One of the most important waterfowl concentration points in Mexico is found in the great irrigation projects in the valleys of the Yaqui and Mayo Rivers, Sonora. Here probably 300,000 acres are under canal systems for the growing of wheat, rice, and garbanzo (an important pealike crop). These fields are a very important source of food for the wildfowl, one rancher telling the investigator that every night the ducks were eating 3 to 4 tons of his rice, which had not yet been threshed.

Sinaloa, the next State south, has a similar situation in the valleys of the Fuerte, Sinaloa, and Culiacan Rivers, while from the seaport town of Mazatlan to the valley of the Rio Grande de Santiago in Nayarit, a distance of fully 100 air miles, across parts of both States there is a continuous

chain of coastal estuaries, sluggish rivers, lakes, marshes, and swamps. Some of the river valleys extend a considerable distance back into the Sierra Madre Mountains, and ducks, geese, and cranes are found as far up these rivers as 75 miles from their mouths.

The situation is similar in Nayarit, and because of the justly famed Lake Chapala, in Jalisco and Michoacan also. Here the delta of the Lerma and Duero Rivers has been partially drained, but the area still remains one of the greatest concentration places for ducks. Also in Michoacan are the important lakes of Patzcuaro and Cuitzeo.

In all the smaller States visited, the Survey biologist found abundant waterfowl habitat and on the Laguna de Coyuca and Laguna de Tres Palos, in Guerrero, a veritable paradise for wintering lesser scaups, pintails, baldpates, and other ducks.

Although on a somewhat smaller scale, comparable waterfowl conditions were found in interior States where river valleys, natural lakes, and reservoirs contribute to the requirements of the ducks and geese. In concluding his report, which treats each State and species, the Bureau investigator asserts that "After coordinating all available facts and factors I am able to state positively that the duck and goose population of western Mexico showed marked improvement in numbers over that of preceding years."

On the east (Gulf) coast, the Central Flyway biologist divided his time between the wintering grounds of the Laguna Madre section of southern Texas and the coastal parts of eastern Mexico (see map, p. 4). An aerial reconnaissance was made from the Rio Grande to the northeastern tip of the Yucatan Peninsula, while ground work by car was carried on along the coast of Tamaulipas and northeastern Vera Cruz.

Important as are the wintering grounds for ducks and geese in Texas, particularly the coastal section, the marsh and water areas in eastern Mexico bear almost the same relation to the birds of the Central Flyway as do those of western Mexico to the waterfowl of the Pacific Flyway.

It appears that the more important wintering grounds in eastern Mexico are the coastal lagoons of Tamaulipas, the Tamiahua Lagoon and Tlacotalpan district of Vera Cruz, the coastal lagoons and marshes in the northeastern part of Tabasco, and the narrow coastal lagoons and marshes around the peninsula of Yucatan. Continued drought in the coastal regions of Tamaulipas and Vera Cruz has greatly reduced the number of fresh-water lakes and ponds available for wintering waterfowl and has naturally accentuated wildfowl concentrations in coastal waters. Many pintails, gadwalls, baldpates, and teals that ordinarily winter farther north on the coast of Tamaulipas apparently continued southward to the fresh-water lagoons near Tampico, or even to Vera Cruz and beyond. Very few mallards winter farther south than the Mexican border.

An aerial survey of the coastal districts, made by the Survey biologist in 1937, gave a basis for comparison with data obtained in 1938. The flights were extremely low, so that great accuracy was possible not only in identifications, but also in the estimation of numbers. In his preliminary report the investigator indicated that "there is satisfactory evidence of a definite increase in some species." Although local reports of greater increase were obtained, he believed that the general increase was possibly 10 percent over the winter population of 1937-38. He estimated that there were at least 5,000,000 ducks in the coastal lagoons and marshes of eastern Mexico, mostly concentrated in 11 areas.

Information obtained by these biologists indicates that the total take of waterfowl by Mexicans is so low as to be almost negligible. The extent of market hunting (which is legal) has been and still is grossly exaggerated, emanating chiefly from people who do not know Mexico. At a few places along the routes followed by tourists, ducks are sold in markets and served in restaurants, where they are purchased by persons of means, notably foreigners. Those familiar with cities immediately south of the international border naturally infer that the serving of game dinners is general, whereas it is done near the border chiefly to attract foreign tourists. The fact is that there are very few cities in Mexico where game is marketed to any considerable extent. Mexico City is obviously the most important, as it is a gathering point for visitors from all over the world. Guadalajara, the second city in the country, is wealthy, but does not attract as much tourist business. Survey biologists have been unanimous in reporting that they have never found many ducks in the markets of that city and that very few are served in its cafes and restaurants. In commenting upon this, one of the investigators added: "In the last analysis, while the marketing of game is not in accord with the ethics of the United States and Canada, after all the practical consideration at the moment is, how many game birds are killed in Mexico in comparison with the number taken in the United States and Canada, not how or for what purpose." Vigorous efforts are being made by the Mexican game authorities to enforce the law prohibiting the use of armadas, and troops of the regular army have been employed for this purpose.

Studies in the United States

The biologists of the Mississippi and Atlantic Flyways devoted the winter to constant checking and rechecking of the concentrations at the southern ends of these two great areas, which, unlike the Pacific and Central Flyways, constitute waterfowl wintering grounds that are chiefly in the United States (see map, p. 4). It is for this reason that Federal refuges in the lower Mississippi Valley and on the South Atlantic and Gulf coasts are of such great importance. Other investigations also were made bearing upon the sound administration of waterfowl. Work in the Mississippi Flyway was carried on in Louisiana and parts of Texas and Mississippi, and north to southern Illinois. As the winter was decidedly "open," large numbers of ducks successfully spent the season in Missouri, Illinois, Iowa, and even as far north as Minnesota.

As a result of his work, the biologist of the Mississippi Flyway concluded that waterfowl in general showed a definite increase. Arriving at this decision was not a simple matter, as the situation varied greatly in different sections. For example, on parts of the Texas coast the increase was apparently as much as 100 percent, while Arkansas in general seemed to have a shortage, and even favored areas in northern Louisiana, such as Catahoula Lake, showed a decided shortage compared with concentrations observed there in past seasons. On the other hand, the adjacent Delta Migratory Waterfowl Refuge reported a substantial increase in wintering ducks but some reduction in geese.

The general increase affected practically all species of ducks and was particularly gratifying in the case of the canvasback and the redhead. Although the blue goose is an abundant species in winter on the Louisiana coast, there was an apparent shortage this year of immature birds. This situation had been reported earlier in the season by Canadian officials on the basis of reports from the James Bay region and appears to indicate an unsuccessful breeding season for this species. Since relatively few of these birds are shot either in the United States or in Canada, this shortage in one season cannot be viewed with apprehension.

In the wintering grounds of the Atlantic Flyway, waterfowl conditions remained satisfactory throughout the season. Investigations were made southward along the coastal areas from New Jersey and Delaware to Florida, and certain areas were repeatedly surveyed from the air. The wintering grounds from Chesapeake Bay southward were in excellent condition, and a general increase in most species was obvious. The Savannah River Wildlife Refuge, in Georgia, had the greatest concentration of waterfowl in its history.

One of the serious problems affecting waterfowl on the wintering grounds of the Atlantic Flyway is the heavy pollution of some of the waters. Large concentrations of ducks were found on the Delaware River, a stream that is badly polluted, not only by civic and industrial waste, but also by oil, an agent particularly destructive to waterfowl. This condition also exists in the general vicinity of New York City, where, within a few miles of the metropolis, a Bureau officer reported that late in January there were about 200,000 ducks, brants, and Canada geese feeding in filthy, oily waters.

JANUARY INVENTORY

The fifth annual inventory of migratory waterfowl was made in January 1939, as usual under the leadership of the 10 regional directors of the Biological Survey. As in past years, full cooperation was extended by the Army Air Corps, the Naval Air Service, Coast Guard, Forest Service, Soil Conservation Service, National Park Service, State forestry and game and fish departments, a commercial rubber company, and many other individuals and agencies, and in addition practically the entire field force of the Survey was drafted for the work.

Aerial coverage was as complete as possible and included the entire Atlantic and Gulf coasts. In Region 7 alone (southeastern) 11 planes, and 3

blimps were used, in addition to 18 powerboats and 29 cars, with a total of 240 observers. One agent in this region used the novel transportation medium of a locomotive on a waterfowl area crossed by rails. In Region 8 (northeastern), in addition to planes of the Coast Guard, 2 blimps from the Naval Air Station at Lakehurst, N. J., were employed, flying parallel courses. On one of the return trips the high head winds encountered gave the observers and airship crew some anxious moments. After arriving safely at the base the officer in command expressed the thought of all aboard that if there hadn't been a little lull they would have stood a good chance of being blown to Europe.

In a few areas severe storms complicated the operations and undoubtedly resulted in the tabulation of smaller numbers of birds than would have been observed only a short time previously. Nevertheless, in most cases familiarity with the situation enabled the agents to make proper allowances, and usually sudden decreases in one area were compensated for by corresponding increases in others. Experience in the work has contributed greatly to the accuracy of the results, so that while coverage of the entire country is still far from complete, for comparative purposes it is felt that the data assembled are as nearly accurate as can be expected in an operation of such magnitude and complexity.

Inquiries are frequently addressed to the Survey asking why the details of the inventory are not publicized. The answer is that the figures obtained are of value chiefly in showing the trends in continental wild-fowl abundance, and that if they were made public it would be natural for them to be accepted as actual counts. In other words, the estimates are not construed by the Bureau as an exact enumeration, and it is for this reason that the word "census" is not employed. By comparison with similar figures obtained in the same areas by the same observers and at the same time in previous seasons, the estimates do permit the computation of percentages of increase or decrease that are useful in bookkeeping on a continental scale for this important natural resource.

The grand total in waterfowl for all regions for the 1939 inventory was about 14,500,000, which represents an increase of about 14 percent over 1938. The ratios between figures for all species are not the same---for a few a decrease was noted. Important gains were noted in some of the principal game species---the mallard, black duck, pintail, baldpate, and the scaups, the latter being somewhat surprising in view of the reports obtained earlier in the season. Particularly encouraging is a substantial gain in the numerical status of the redhead. Geese in the aggregate show a decrease, a small increase in the Canada goose being offset by a considerable decrease in the blue goose, probably due to the poor breeding season previously mentioned. The coot, or mud hen, unfortunately shows a disproportionate increase, as there is evidence that this bird is already overabundant for the welfare of other waterfowl more desirable to man. When properly prepared this is a good table bird, and sportsmen would assist in rectifying an unbalanced condition if they would add an increased number of coots to their game bags instead of hunting only the less numerous ducks.

To sum up, the status of waterfowl as shown by the January inventory is considered satisfactory, although the numerical total is still far below what it was only a decade or so ago. The leveling off previously mentioned is illustrated on the chart (p. 3).

WATERFOWL BAGS

Some sportsmen feel aggrieved if they do not kill the legal bag limit of ducks every time they visit a duck marsh. On the other hand, the proportion of hunters who actually achieve this objective is small. During the year a check was made by game-management agents, refuge managers, and biologists in all parts of the country of the bags reported by many hunters. From these data it appears that daily bags of 4 to 6 are better than average and that for the entire country the seasonal average is less than 9. A study of this problem was conducted on excellent waterfowl area in Texas. On checking the bags of 294 hunters it was found that the average kill was 4.4 ducks and 0.23 geese, in addition to 1.4 ducks that could not be found, and that the average expenditure in ammunition was one box of shells per hunt, or 5.6 shells per duck.

This low average kill is fortunate, for were each of the nearly 1,000,000 waterfowl hunters in the country to take the legal limit on only 2 days during the open season, an entirely closed season would be inevitable. A harvest of probably 25,000,000 ducks (including cripples and unretrieved birds) is much more than the annual increase, or "crop." The fetish of limit bags should be relegated to the limbo of baited blinds and punt guns, and wildfowling should take its place as a recreation rather than an orgy of killing.

CONCLUSION

Continuous studies of migratory waterfowl, made from the Arctic breeding grounds to wintering grounds in subtropical regions, indicate that the numerical status of the birds continues to improve. The upward curve has shown a tendency to level off, but nevertheless, its direction, if not its angle, can be considered as satisfactory evidence that the combined program of habitat restoration and improvement and of restriction of the legal take is producing the results so greatly desired by all conservationists---naturalists and sportsmen alike.